

## Claims

1. An angular velocity measuring apparatus for detecting an angular velocity of a rotation about a rotation axis, comprising:

a vibration element;

a vibration element supporting member for supporting said vibration element;

a circuit board for supporting said vibration element by means of said supporting member; and

a semiconductor integrated circuit chip for controlling signals for the vibration element;

wherein said semiconductor integrated circuit chip is mounted on said circuit board by flip-chip bonding, and said vibration element is mounted on said semiconductor integrated circuit chip by means of said supporting member.

2. The angular velocity measuring apparatus according to claim 1, wherein said vibration element and semiconductor integrated circuit chip are arranged to be overlapped with each other viewed in a direction in which said rotation axis extends.

3. The angular velocity measuring apparatus according to claim 2, wherein said vibration element is arranged in a plane which is substantially perpendicular to said rotation axis.

4. The angular velocity measuring apparatus according to claim 3, wherein said semiconductor integrated circuit chip is arranged substantially in parallel with said vibration element.

5. The angular velocity measuring apparatus according to claim 4, wherein said apparatus further comprises a can-package having a can-package base and a lid hermetically secured to the can-package base along its periphery to constitute a space, said vibration element, supporting member, circuit board and semiconductor integrated circuit chip are installed within said space, and said circuit board is connected to conductor pins which extend into said space via through-holes formed in said can-package base.

6. The angular velocity measuring apparatus according to claim 4, wherein said circuit board is formed by a ceramic circuit board having a base portion and a side wall portion defining an opening, and said apparatus further

comprises a lid hermetically secured to said side wall portion of the ceramic circuit board to close said opening and to constitute a space, and said vibration element, supporting member and semiconductor integrated circuit chip are installed within said space.

7. The angular velocity measuring apparatus according to claim 6, wherein said ceramic circuit board includes step portions formed on a surface of said base portion on which said semiconductor integrated circuit chip is mounted, and said vibration element is connected by bonding wires to said ceramic circuit board at said step portions.

8. An angular velocity measuring apparatus for detecting a rotational angular velocity about a given rotation axis, comprising:

- a vibration element;
  - a vibration element supporting member for supporting said vibration element;
  - a semiconductor integrated circuit chip for controlling signals for the vibration element;
  - a ceramic circuit board for supporting said vibration element by means of said supporting member; and
  - a lid hermetically secured to said ceramic circuit board to constitute a space;
- wherein at least said vibration element and vibration element supporting member are installed within said space.

9. The angular velocity measuring apparatus according to claim 8, wherein said vibration element and semiconductor integrated circuit chip are arranged to be overlapped with each other viewed in a direction in which said rotation axis extends.

10. The angular velocity measuring apparatus according to claim 9, wherein said vibration element is arranged in a plane which is substantially perpendicular to said rotation axis.

11. The angular velocity measuring apparatus according to claim 10, wherein said semiconductor integrated circuit chip is arranged substantially in parallel with said vibration element.

12. The angular velocity measuring apparatus according to claim 11,

wherein said semiconductor integrated circuit chip is mounted by flip-chip bonding on a surface of said ceramic circuit board defining said space, and said vibration element is mounted on said semiconductor integrated circuit chip by means of said supporting member.

13. The angular velocity measuring apparatus according to claim 11, wherein said semiconductor integrated circuit chip is mounted on a surface of said ceramic circuit board, said surface being opposite to a surface of the ceramic circuit board defining said space.

14. The angular velocity measuring apparatus according to claim 11, wherein said apparatus further comprises a fitting member having a base portion and a side wall portion formed along a periphery of said base portion, said semiconductor integrated circuit chip is mounted on said base portion of the fitting member, and said ceramic circuit board is hermetically secured to said side wall portion of said fitting member to constitute a space within which said semiconductor integrated circuit chip is installed.

15. The angular velocity measuring apparatus according to claim 14, wherein said fitting member is formed by a ceramic circuit board.

16. The angular velocity measuring apparatus according to any one of claims 8-15, wherein said ceramic circuit board includes step portions formed in a surface facing said vibration element to protrude toward the vibration element, and said vibration element is connected to said step portions of ceramic circuit board by means of bonding wires.

17. An angular velocity measuring apparatus for detecting a rotational angular velocity about a given rotation axis, comprising:

a vibration element;

a vibration element supporting member for supporting said vibration element;

a circuit board for supporting said vibration element by means of said supporting member;

a semiconductor integrated circuit chip for controlling signals for the vibration element;

a can-package having a can-package base and a can-package lid hermetically welded to the can-package base to constitute a space; and

a plurality of conductor pins extending into said space through said can-package base and electrically connected to said circuit board;  
wherein said vibration element is mounted on one surface of said circuit board by means of said vibration element supporting member, said semiconductor integrated circuit chip is mounted on the other surface of the circuit board by bare-die-bonding and is connected to the circuit board by bonding wires, said circuit board and said conductor pins secured to the can-package base are fixed by a silver paste.

18. The angular velocity measuring apparatus according to claim 17, wherein said vibration element and semiconductor integrated circuit chip are arranged to be overlapped with each other viewed in a direction in which said rotation axis extends.

19. The angular velocity measuring apparatus according to claim 18, wherein said vibration element is arranged in a plane which is substantially perpendicular to said rotation axis.

20. The angular velocity measuring apparatus according to claim 19, wherein said semiconductor integrated circuit chip is arranged substantially in parallel with said vibration element.

21. The angular velocity measuring apparatus according to claim 1 or 12, wherein an ambient temperature of said vibration element is controlled by utilizing a heat generated by said semiconductor integrated circuit chip.

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